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STATE OF ALASKA

William A. Egan, Governor

ANNUAL REPORT OF PROGRESS, 1969 - 1970

FEDERAL AID IN FISH RESTORATION PROJECT F-9-2

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

Wallace H. Noerenberg, Commissioner

DIVISION OF SPORT FISH

Rupert E. Andrews, Director

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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska, Federal Aid In Fish Restoration, Project F-9-2, "Sport Fish Investigations of Alaska".

The studies reported herein are investigations evaluating the sport fish resources of the state. Recreational and other impacts on the fishery resources necessitates a continuous endeavor of ascertaining facts and knowledge of the fisheries. The 24 jobs reported on are of a continuing nature. The investigations are composed of 11 projects involved with the inventory and cataloging of the sport fish waters of the state, sport fishery creel censuses, and access. Fish species that received special investigational effort include: Dolly Varden, anadromous fish, grayling, sheefish, whitefish, pike, char, and salmon. The information gathered from the combined studies provides necessary background data for a better understanding of management problems and constitutes a basis for necessary future investigations.

The subject matter contained in these reports is incomplete, and the findings and interpretations subject to re-evaluation as work progresses.

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-2 *Name:* Sport Fish Investigations of Alaska.

Job No.: 16-B, *Title:* **Investigations of the Tanana River and Tangle Lakes Grayling Fisheries: Migratory and Population Study.**

Period Covered: July 1, 1969 to June 30, 1970.

ABSTRACT

Population estimates of Arctic grayling, Thymallus arcticus, were made for two sections of the Chena River with means of 954 and 913 fish per mile and for the Tangle lakes where an estimated 36,985 fish were calculated.

Creel census programs revealed 7,998 angler hours and 7,686 grayling harvested on the upper Chena River and 6,928 angler hours and 5,542 grayling harvested at Badger Slough.

A potential location for taking grayling eggs was found at the outlet of Mineral Lake. Spawning observations were also made at this location.

Observations of overwintering grayling were made on the upper Chena River.

Grayling fry were stocked in four waters in 1969. Dissolved oxygen determinations and test netting revealed that grayling can be successfully introduced into lakes with very low winter D.O.'s and also in the presence of chub or grayling populations.

Age and growth data was obtained from the Chena River, Goodpaster River, and Tangle lakes.

RECOMMENDATIONS

1. Continue grayling population estimates annually in selected areas of the Chena River.
2. Continue the creel census programs on the upper Chena River and Badger Slough.
3. Locate grayling spawning areas in major Tanana River tributaries and continue the study of spawning habits.
4. Continue experimental stocking studies to determine conditions necessary for grayling survival and growth in lakes and ponds.
5. Intensify grayling overwintering studies on the Chena River.
6. Investigate the possible existence of separate grayling populations in various reaches of the Chena River.

7. In conjunction with the above studies, collect age and growth information and other life history data when feasible.

OBJECTIVES

1. To repeat grayling population estimation initiated in sections of the lower Chena River in 1968 to follow population trends.

2. To apply techniques for population estimation developed in 1968 to sections of the Badger Slough, Salcha and Goodpaster rivers, and, if possible, to the Delta Clearwater River and Tangle lakes system.

3. To conduct periodic censuses on the Chena and Salcha rivers, Badger Slough, and the Tangle lakes for comparison with 1968 creel census programs on these waters. To conduct summer creel census of the Goodpaster and Delta Clearwater rivers and spring creel census of Shaw Creek, Mineral Lake outlet, and other accessible grayling fisheries to further overall knowledge of Interior grayling utilization.

4. Concomitant to spring creel census efforts, to seek locations for possible future grayling egg takes.

5. To locate overwintering areas of grayling in the Chena River, and tag the captured grayling to learn their intrastream movements.

6. To conduct follow-up studies to further assess survival and growth of grayling experimentally introduced to various Interior waters. To stock additional grayling fry as suitable waters are located and to introduce an experimental stock of grayling fry to Deadman Lake to assess survival in the presence of a pike population.

TECHNIQUES USED

Most of the grayling used in population and intrastream migration studies were captured by an A.C. boom shocker boat. This boat was described in previous reports by Van Hulle (1968) and Roguski and Winslow (1969). In the Tangle lakes, however, it was necessary to use hook and line to obtain sufficient numbers of fish for population estimation.

All grayling over 145 mm in length were tagged with a numbered FD-67 internal anchor tag inserted in the dorsal musculature by means of an FD-67 tagging gun (Floy Tag Co.). The right pelvic fin was clipped from all tagged fish for tag loss information and also from grayling smaller than 145 mm for population estimates.

Estimation of grayling populations was accomplished by the Schnabel tag-and-recapture technique (Roguski and Winslow, 1969).

The Chena River was divided into sections as established by Van Hulle (1968, Figure 1).

Estimates of angler usage of the Badger Slough and Chena Hot Springs Road area of the Chena River were made utilizing a randomized angler count system. Counts were stratified to provide greater sampling during high-use periods. This method was suggested and outlined by Mr. Sam Harbo, a biometrician at the University of Alaska. Only returns from completed angler trips were used in computing catch statistics for the above creel censuses.

For the third year, a biologist and vehicle, along with a house trailer check station, were provided for the upper Chena River creel census through the cooperation of the Fish and Wildlife Service, River Basin Studies.

Dissolved oxygen determinations were made with a Hach OX 2-P drop titration kit. Gill nets used to sample grayling-stocked lakes were of monofilament construction, 125' x 6', with five graduated mesh sizes ranging from 1/2" - 2 1/2" bar measure.

A Bausch and Lomb microprojector was used for aging grayling scales. Scales of fish larger than 100 mm were impressed on cellulose acetate with an Ann Arbor Roller Press prior to reading. Scales of fish smaller than 100 mm were mounted on glass slides.

FINDINGS

Population Estimation

The summer populations of yearling and older grayling were estimated in two sections of the Chena River and in the Tangle lakes system during June, July, and August, 1969 (Table 1). The Tangle lakes is a system of interconnected lakes forming the headwaters of the Delta River.

TABLE 1 Schnabel Estimates of the 1969 Summer Population of Grayling in the Chena River and Tangle Lakes.

Location	Estimate	90% Confidence Limits
Chena River Sec. 2*	954 fish per mile	758- 1,360
Chena River Sec. 6**	913 fish per mile	702- 1,305
Long Tangle Lake Riffle***	36,985 fish	28,278-53,443

*River mile 6 to 11
**River mile 22 to 25
***Between Long Tangle Lake and Lower Tangle Lake.

The Chena River population estimates were made from samples taken between June 9 and August 29. A total of 784 fish were taken by electro-shocking in Section 2 (between Wendell Street and Peger Road) and 569 fish were taken in Section 6 (from the Little Chena River to Badger Slough).

In 1969 the estimated grayling population in the Chena River was 954 fish per mile in Section 2 and 914 fish per mile in Section 6. This was considerably higher than the 1968 estimates of 657 fish per mile in Section 2 and 452 fish per mile in Section 6. There is no obvious explanation for this increase as no significant changes were made in sampling technique from 1968 to 1969.

The Tangle lakes population estimate was also made from samples taken throughout the summer and consisted of 1,716 grayling captured at Long Tangle Riffle (the stream or riffle area between Long Tangle Lake and Lower Tangle Lake). This riffle appears to be a feeding area for fish from much of the Tangle lakes system. Fish tagged here were recaptured the same summer at locations of up to four miles upstream and two miles downstream. The Tangle lakes fish were captured by hook and line, as very clear, poorly conductive water precluded the use of the boom shocker boat.

Intrastream Movements

TABLE 2 Creel Census Results on Chena Hot Springs Road, July 1 to September 30, 1969.

	Angler Hours				
	Weekdays		Weekends & Holidays		
Period	6 AM to 10 AM	After 10 AM	Before 10 AM	10 AM to Midnight	Total
7/2-29	198	852	552	2,447	4,049
7/30-8/26	16	710	75	462	1,263
8/27-9/30	64	516	48	2,058	2,686
				Total Angler Hours	7,998

No. Angler Trips	1,936	
Mean Hours/Angler Trip	4.13	
Total Grayling Catch	7,686	
Grayling/Angler Hour	.961	
Angler Composition:		
Local Military	32.8%	
Local Non-Military	55.5%	
Tourist	11.7%	
Distribution of Fishing Pressure:		
26.5 Mile to First Bridge at 37.7 Mile		55.2%
From 37.7 Mile Bridge to 53.5 Mile		44.8%

Recaptures of 1969 tagged fish in the Chena River revealed that little movement occurred during the summer. Of 93 recaptures, 67 (72%) showed no movement, 14 (15.1%) moved upstream, and 12 (12.9%) moved downstream. This total egress from the sample sections of 28% is identical to that noted in 1968. Detailed analysis of tag-and-recapture data will be presented in the 1970-71 annual report as a much larger number of recaptures will then be available.

Angler Utilization

Chena River:

The creel census program on the upper Chena River initiated in 1967 (Van Hulle, 1968) and intensified in 1968 (Roguski and Winslow, 1969) was continued in 1969. The census was again conducted on the section of the Chena River and its North Fork running parallel to the Chena Hot Springs Road for approximately 27 miles. The census was conducted by a biologist quartered at a check station at 26.5 Mile, Chena Hot Springs Road, as this portion of the river is readily accessible to the roadside angler.

The study was conducted between July 1 and September 30 and consisted of two concurrent phases. One was the interviewing of anglers who had completed fishing. The second phase was estimation of total anglers by counts at randomly selected times.

The census design involved sampling on 20 of each 30 days. Each day was divided into 9, two-hour periods between 6 AM and 12 PM. Sampling effort was stratified as follows:

Weekdays 6 AM to 10AM	1/5 of the periods
Weekdays 10 AM to midnight	1/3 of the periods
Weekends and holidays 6 AM to 10 AM	1/2 of the periods
Weekends and holidays 10 AM to midnight	2/3 of the periods

The results of the 1969 Chena Hot Springs Road creel census appear in Table 2. The number of angler hours in August was low because heavy rain in early August washed out the road in several places. The road was not opened for its full length until August 20. The 1969 figures are not readily compared to the previous year because the 1968 census began two months earlier and ended one month earlier; however, the two overlapping months, July and August, indicate that fishing pressure was slightly greater in 1968 than 1969 (Table 3).

Table 3 shows an increased success rate in 1969. This can probably be accounted for by the extremely low water conditions in July and September that concentrated grayling in large pools where they were easily taken by anglers.

In 1968, 49.1% of the fishing effort was expended in the area between the check station at 26.5 Mile and the first bridge at 37.7 Mile (Roguski and Winslow, 1969), the approximate area that will be inundated by the proposed Fairbanks Flood Control Dam. In 1969, 4,415 man hours or 55.2% of the effort was expended in this area.

Table 4 presents data from the 1969 creel census of Badger Slough, a clearwater tributary of the lower Chena River. This small stream, situated close to Fairbanks, supports an early and intensive grayling fishery which ends by mid-July. In 1969 there was a decline in both angler hours and catch rate from 1968 (Table 5).

TABLE 3 Comparison of 1968 and 1969 Chena River Creel Censuses.

Effort:

Period	Angler Hours
6/29 - 8/2/68	4,984*
7/2 - 7/29/69	4,049
8/3 - 9/2/68	2,181*
7/30 - 8/26/69	1,263

Success:

	1968	1969
Grayling/Angler Hour	0.55*	0.96

*From Roguski and Winslow, 1968.

TABLE 4 Creel Census Results from Badger Slough, April and May, 1969.

	Angler Hours		
Period	Weekdays	Weekends	Total
4/12-30	630 (5)	924 (7)	1,554
5/1-31	2,910 (5)	2,464 (7)	5,374
		Total Angler Hours	6,928

Number of Angler Trips	3,841
Mean Hours/Angler Trip	1.8
Total Grayling Catch	5,542
Grayling/Angler Hour	.80
Angler Composition:	
Local Military	31%
Local Non-Military	69%
Tourist	0%

TABLE 5 Comparison of the 1968 and 1969 Badger Slough Creel Censuses.

Effort:

Period	Angler Hours
4/17-30, 1968*	3,142
4/12-30, 1969	1,554
5/1-31, 1968*	5,828
5/1-31, 1969	5,374

Success Rate:

	1968	1969
Grayling/Man Hour	0.82*&**	0.80***

*From Roguski and Winslow, 1969.
**Based on sampling from 4/12 through 7/15.
***Based on sampling from 4/12 through 5/31.

The estimated angler effort for both the Chena Hot Springs Road and Badger Slough was 14,926 angler hours. This figure is much lower than the total angler effort on the entire Chena River system because considerable angling is done in areas not censused and at times of the year other than those censused.

Although accessibility and fishing pressure on the Chena River have increased over the years, the catch per unit of effort has remained fairly constant. The 1956 creel census on the Chena River revealed a catch per man hour of 0.95 fish (Warner, 1957). This compares to the 0.96 fish per man hour taken on the Chena River in 1969 (Table 2).

Delta Clearwater River:

On May 23, 1969, the Delta Clearwater River was sampled by shocker boat between Mile 13 and Mile 3 in an attempt to estimate the grayling population. Only 13 grayling, plus large numbers of round whitefish, Prosopium cylindraceum, and silver salmon, Oncorhynchus kisutch, smolts were captured.

The grayling ranged in length from 258 - 420 mm. Although the water temperature was 41°F, the approximate temperature at which grayling spawn, only one male and one female grayling appeared to have spawned recently. All others were judged immature or to have spawned a considerable time earlier.

On June 22, 1969, the lower seven miles of the Delta Clearwater River were shocked intermittently.

Only five grayling were captured, and a small number observed in the highly transparent water. Whitefish were again abundant.

Although both silver salmon fry and smolt were found, no yearling or other young grayling were captured or observed on either sampling date. Thus, it could not be demonstrated that this river produces its own grayling.

Spawning Observations

Chena River:

On May 12 and 14, 1969, the Chena River was sampled intermittently by shocker boat between Mile 79 and Mile 25. The water temperature was 40°F. Although the water was too turbid for observation of spawning, ripe or spawned out grayling were captured over the whole distance. Several times ripe pairs were captured simultaneously. It is probable that spawning also occurs both above and below this area.

Fifty-eight grayling were sampled to determine length at maturity and spawning condition (Table 6). The smallest mature male was 265 mm in length and the smallest mature female was 225 mm. Most Chena River grayling over 260 mm fork length appear to be sexually mature.

TABLE 6 Fifty-Eight Chena River Grayling Sampled to Show Length at Maturity, 1969.

	Length Range	Number Captured	Number Mature
Male:	Under 240 mm	2	0
	240 - 249	2	0
	250 - 259	1	0
	260 - 269	1	1
	270 or greater	17	17
Female:	Under 240 mm	4	1
	240 - 249	5	1
	250 - 259	2	1
	260 - 269	4	3
	270 or greater	20	20

Mineral Lake:

On May 20 and 21, 1969, spawning grayling were observed in the outlet stream of Mineral Lake, near Tok. On May 20, the water temperature was 39°F in the morning and rose to 41°F by late afternoon. Approximately 50 fish were present on the spawning ground just below the lake. In late afternoon, males

began defending territories four to six feet in diameter and some spawning occurred. Whenever an intruder, mature or immature, entered the territory, the defending male erected his dorsal fin and made agressive movements. The intruder was always driven from the territory.

In most spawning acts, the male and female were positioned side by side and undulated vigorously against each other with dorsal fins erect. A large cloud of silt was raised, obscuring observation of any eggs that may have been deposited. In one observation, the male folded his dorsal fin over the female during the undulations. Spawning acts lasted 5 to 20 seconds. One female was observed to mate four times with the same male within a two-minute period. Spawning acts had durations of 5 to 14 seconds. During the last act, a competing male came alongside and slightly under the male and joined in the act.

An immature 260 mm male which had been intruding on territories all afternoon was captured. Its stomach contained approximately 40 grayling eggs. Four immature females captured contained one to five eggs in their stomachs.

On May 21, the water warmed to 46°F and approximately 200 fish were noted on the spawning ground just below the lake, but it was not determined how many of these fish were spawners. Spawning was much more frequent than on the previous day, even in brightly sunlit areas.

This area appears to be a good potential egg-take site. A weir could be constructed across the shallow stream or a bag seine could be set below the main spawning area and grayling driven into it with another seine.

Grayling Introductions

During 1969 four lakes were experimentally stocked with grayling fry (Table 7). The large stock of 253,000 fry to Deadman Lake near Northway, was made in an attempt to establish grayling in the presence of a northern pike, Esox lucius, population. Deadman Lake has an area of 340 acres and a maximum depth of 30 feet. It is a fertile lake abundant with invertebrates. This lake had been rehabilitated in 1954 and provided excellent rainbow trout, Salmo gairdneri, fishing prior to recontamination with pike.

TABLE 7 Lakes Stocked with Grayling Fry, 1969.

Name	Location	Date	Number	Competing Fish
Bailey Pond	Chena Hot Springs Rd.	6/10	10,000	Pike
Deadman Lake	Alaska Highway	6/10 6/13	120,000 133,000	Pike
Otto's Lake	Healy	6/10	60,000	Grayling
31-Mile Pit	Richardson Highway	6/10	10,000	None

Bailey Pond is a one-acre pond near the Chena Hot Springs Road at Mile 21. Despite excellent winter dissolved oxygen levels (8.5 ppm) in 1968-69, there was no survival of stocked grayling fry. The only fish captured was a 455 mm pike. The pond was restocked with grayling in 1969, and winter D.O. levels were again excellent in 1969-70 (Table 8).

Big Lake was stocked with grayling fry in 1967, and by 1968 was providing a popular fishery for these

TABLE 8 Sampling of Waters Stocked with Grayling.

Lake	Lowest Measured D.O. (ppm)	Date	Fish Caught*	Date Caught	Mean Length (mm)	Size Range (mm)	Year(s) Stocked
Bailey Pond	10.0	2/18/70	1 NP	5/27/69	455	---	1968, 1969
Big Lake	0.0	3/15/70	23 GR	6/03/69	216-244	231	1967
Craig No. 1	4.0	3/05/70	16 GR	6/03/69	162-188	171	1967
Craig No. 2	2.0	3/05/70	26 GR	6/03/69	100-122	105	1967
Engineer's Hill	10.0	1/21/70	7 GR 45 Cb	7/29/69	233-245	238	1968
Independent Lake No. 8	---	----	30 GR	8/25/69	214-344	255	1965
Independent Lake No. 9	---	----	13 GR	8/25/69	264-300	286	1965
Left O. P.	2.5	3/05/70	12 GR	6/03/69	198-226	212	1967
19-Mile Pond	0.0	3/12/70	25 BF	5/29/69	---	----	1968
Otto's Lake	1.0	1/27/70	10 GR	5/28/69	150-170	158	1967, 1968, 1969
31-Mile Pit	0.0	1/21/70	0	5/28/69	----	---	1967, 1969

*Cb - Chub; GR - Grayling; BF - Arctic blackfish; NP - Northern pike.

fish (mean length 184 mm, May 24, 1968). The dissolved oxygen level of Big Lake dropped extremely low in 1970, and on March 5, tests showed no dissolved oxygen remaining at a sampling station near the center of the lake. It is probable that a mortality will result from this oxygen depletion.

Otto's Lake was stocked with grayling fry in 1967 and 1968, and both year classes were present in the fall of 1968. The severe winter of 1968-69 caused a total depletion of measurable dissolved oxygen by late March; however, on May 28, 1969, the lake was test netted and ten grayling were captured (mean length 158 mm). Scale analysis showed that these fish were of the 1968 stock.

Many larger, rotted grayling carcasses, probably of the 1967 stock, were observed on the lake bottom.

Fry were again stocked in 1969. On January 27, 1970, the dissolved oxygen measured 1.0 ppm. By March 13, very little free water was found in the lake; however, an unexplained dissolved oxygen level of 4.0 ppm was recorded at one station. This test is believed to be valid, and if so, these small "pockets" of oxygenated water may explain the survival of some grayling in an otherwise anaerobic lake.

Results of netting lakes stocked with grayling appear in Table 8. To correlate survival with winter dissolved oxygen levels, the lowest recorded dissolved oxygen reading was included in Table 8.

Detailed dissolved oxygen data from all grayling-stocked waters tested in 1969-70 is presented in Table 9.

TABLE 9 Dissolved Oxygen of Grayling-Stocked Waters, 1969-70.

Name	Date	Sample Depth (feet)	Ice Depth (inches)	Snow Depth (inches)	Oxygen (ppm)
Bailey Pond	2/18/70	3	26	6	10.0
Big Lake	2/15/70	5	38	5	2.5
	3/05/70	3	39	1	0.0
Craig No. 1	3/05/70	3	22	9	4.0
		15			3.5
Craig No. 2	3/05/70	3	22	8	2.0
		26			Trace
Deadman Lake	2/26/70	10	23	11	4.0
		16			2.5
Engineer Hill Lake	1/21/70	2	22	5	10.0
	4/07/70	4	36	4	4.5
Left O. P. Lake	3/05/70	3	39	1	2.5
19-Mile Pit	1/26/70	2	23	4	0.5
	3/12/70	3	26	6	0.0
Otto's Lake	1/27/70	6	42	1	1.0
	3/13/70	2	43	0	4.0
31-Mile Pit	1/21/70	2	23	5	0.0

Few clear conclusions can be made at present as many of the stocked lakes are marginal and may support fish one year but not the next. However, it is evident that grayling often survive very low oxygen conditions. As demonstrated in Engineer Hill Lake and Otto's Lake, it is also evident that grayling fry can at times survive in the presence of chub, Hybopsis plumbea, or yearling grayling populations.

Age and Growth

In 1969, grayling age and growth data was collected from the Chena River, Goodpaster River, Tangle lakes, and several stocked lakes containing fish of known age.

Chena River:

Table 10 presents age and growth data from 50 grayling selected to represent approximately equally the length range of all Chena River grayling sampled in 1969.

TABLE 10 Age and Growth of Chena River Grayling, 1969.

Age Class	No. in Sample	Length Range (mm)	Mean Fork Length (mm)
III	11	172 - 215	191.4
IV	19	195 - 272	236.2
V	6	248 - 290	273.0
VI	8	265 - 365	303.5
VII	3	295 - 340	317.0
VIII	3	350 - 368	356.0
Total	50		

Aging by scales is reliable through age class V, but becomes more difficult thereafter. Length ranges are exaggerated as scales were collected throughout the summer. Neither young-of-the-year nor yearlings were sampled. Fish of age class VIII were of the oldest collected. The 1969 Chena River grayling appear to grow slightly faster than the 1968 fish (Roguski and Winslow, 1969), although this may be an error due to small sample size.

Tangle Lakes:

Scales from 79 Tangle River grayling (Table 11) and 70 Goodpaster grayling (Table 12) were aged in the same manner as the Chena River grayling.

The length frequencies of grayling from the Goodpaster River, Tangle lakes, and three areas of the Chena River are depicted in Figure 1. In all five of these areas, only a small percentage of the total fish captured were of mature size (250 - 260 mm or larger).

TABLE 11 Age and Growth of Tangle Lakes Grayling, 1969.

Age Class	No. in Sample	Length Range (mm)	Mean Fork Length (mm)
II	13	99 - 143	119
III	14	150 - 218	177
IV	21	188 - 282	230
V	17	245 - 325	288
VI	3	339 - 360	352
VII	4	348 - 374	365
VIII	7	350 - 395	379
Total	79		

TABLE 12 Age and Growth of Goodpaster River Grayling, 1969.

Age Class	No. in Sample	Length Range (mm)	Mean Fork Length (mm)
II	9	103 - 146	125.5
III	13	125 - 203	171.1
IV	12	182 - 245	215.4
V	11	242 - 298	264.9
VI	9	238 - 331	297.3
VII	4	315 - 354	329.5
VIII	7	325 - 389	351.0
IX	4	345 - 379	361.5
X	1	378	378.0
Total	70		

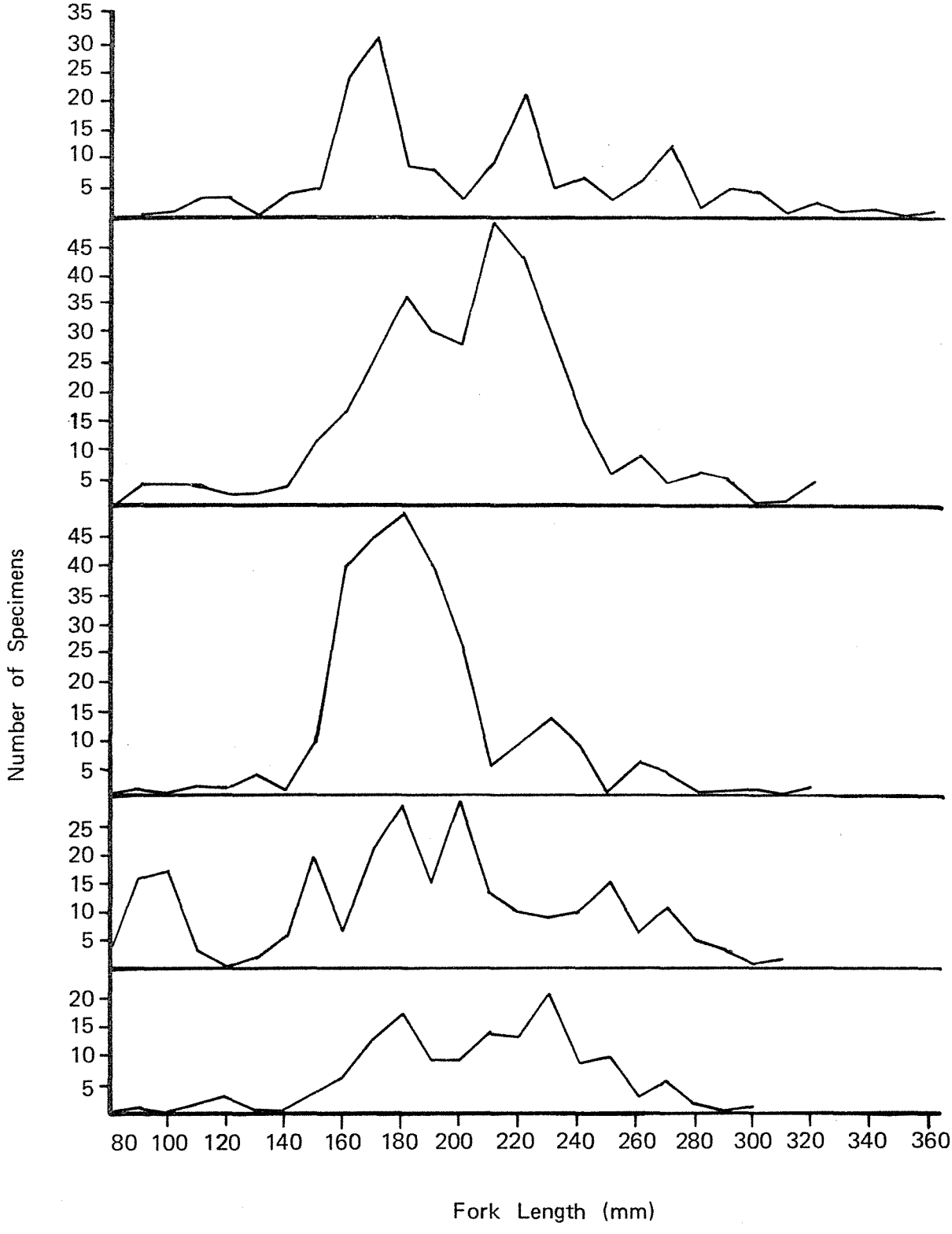

FIGURE 1 LENGTH FREQUENCY OF GRAYLING SAMPLES TAKEN IN FIVE DIFFERENT AREAS OF THE TANANA RIVER DRAINAGE, 1969.

This scarcity of large fish is probably due to a combination of three factors: (a) these fish may be more wary and therefore less easily captured; (b) larger fish may frequent areas other than those sampled, e.g., headwater areas; and (c) relatively few fish survive beyond the age of maturity.

A comparison of the growth rates of grayling in the Chena and Goodpaster rivers and the Tangle lakes appears in Figure 2. Grayling growth rates in the Tangle lakes increases in the third and fourth years of life, whereas growth rates in the rivers remain relatively constant. Growth in the stocked lakes (Table 13) was generally greater than in the rivers. In Engineer Hill Lake, the first year growth was markedly greater than other lakes despite the presence of a large chub population.

TABLE 13 Growth of Known-Age Grayling from Eight Stocked Lakes.

Name	Age Class	No. in Sample	Length Range (mm)	Mean Fork Length (mm)
Big Lake	III	21	216 - 244	231
Craig No. 1	III	16	162 - 188	171
Craig No. 2	III	14	100 - 122	105
Engineer Hill Lake	II	7	233 - 245	238
Independent Lake No. 8	V	19	214 - 344	255
Independent Lake No. 9	V	13	264 - 300	286
Left O. P. Lake	III	12	198 - 226	212
Otto's Lake	II	10	150 - 170	158

Winter Observations

On November 29, 1969, approximately 30 grayling were observed under two feet of transparent ice in the North Fork of the Chena River at river mile 117.

On December 8, six grayling were observed approximately 250 - 300 mm in length at this same location, but a visit there on February 4, 1970 proved unfruitful as opaque overflow ice covered the river. Only two inches of water remained under the ice and it is doubtful if any grayling remained in this area; however, a trapper living five miles downstream reported seeing grayling at this location throughout the winter.

During March in 1967 and 1968, grayling had been captured at river mile 25 (Roguski and Winslow, 1969). Thus, it is likely that grayling overwinter in the Chena River, although further study is needed to determine the size and distribution of the overwintering population.

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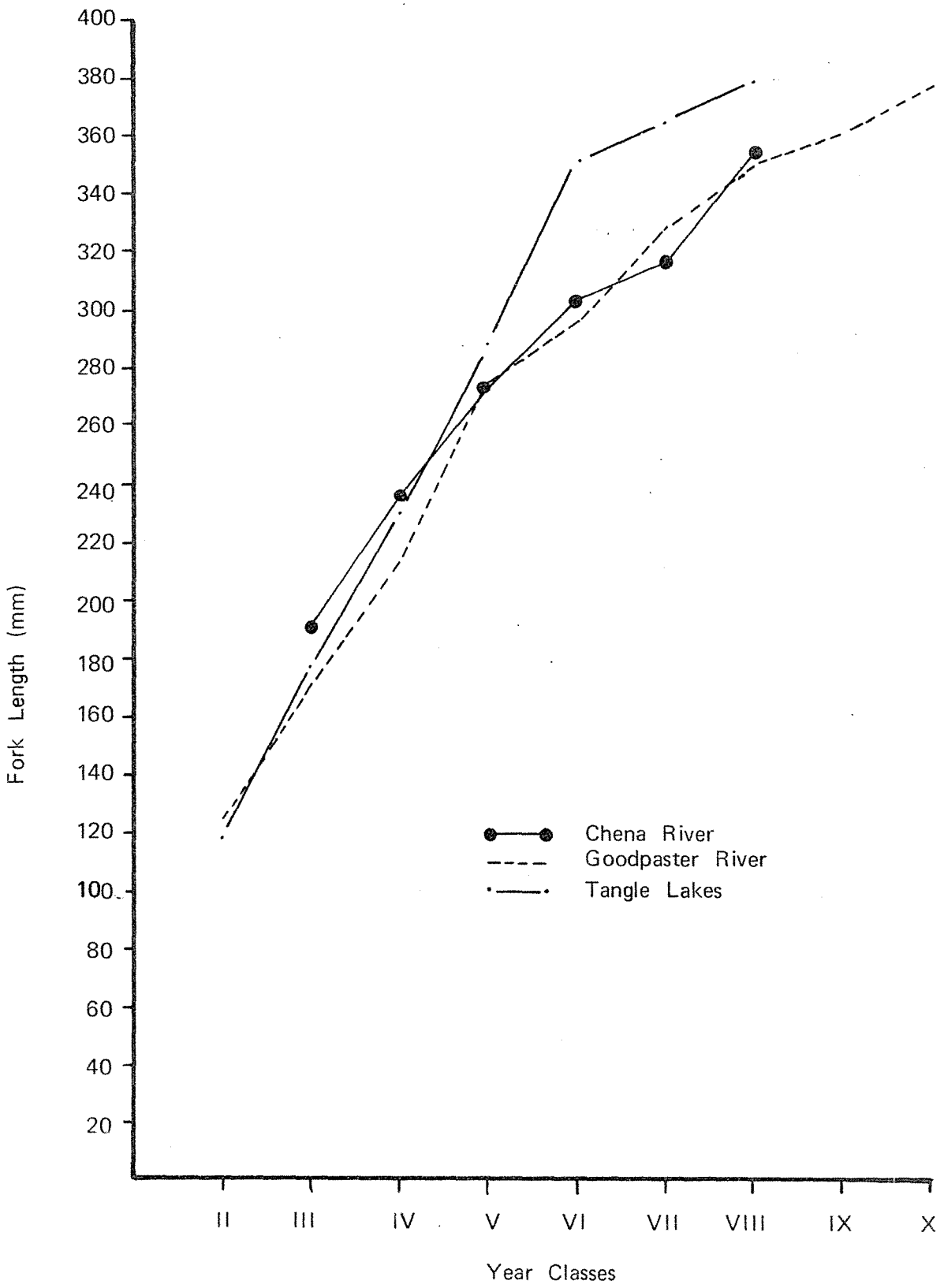

FIGURE 2 COMPARISON OF GRAYLING GROWTH IN THREE INTERIOR ALASKA WATERS, 1969.

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Date: April 1, 1970.

AN ARCTIC GRAYLING TAGGED AND RELEASED FOR MIGRATION STUDY IN THE TANANA RIVER DRAINAGE.